Meteorological Monitoring Program Self-Assessment Tool

DOE Meteorological Coordinating Council

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DMCC Meteorological Monitoring Program Self-Assessment Tool

1. Introduction

The U.S. Department of Energy (DOE) Meteorological Coordinating Council (DMCC) has performed 16 meteorological program assist visits at the DOE/National Nuclear Security Administration (NNSA) sites since 1996. Each of these program evaluations led to observations, recommendations, and improved meteorological monitoring programs. DMCC recognizes that although all DOE/NNSA sites have the interest of receiving an AV, they often do not have the resources required to conduct one.

Accordingly, the Emergency Management Issues Special Interest Group (EMI SIG) has developed a tool for DOE/NNSA site meteorologists to conduct self -assessments or for DMCC to conduct assessments of their DOE/NNSA meteorological program. The use of the DMCC Meteorological Monitoring Program Self-Assessment Tool may lead to more thorough program reviews and a concomitant savings to the site's financial resources.

Presented below are the five attributes of an effective meteorological program, as determined by the DMCC leadership.

The program should be:

1. Designed with meteorological monitoring capabilities that fully address applicable mission requirements; and are appropriate to the activities, hazards, and topographical characteristics of the site or reservation.
2. Constructed with program elements that reflect sound management practices and scientific principles that meet the numerous regulatory requirements associated with the atmospheric sciences.
3. Have access to dedicated, experienced, and fully qualified professionals who perform duties related to protecting personnel, facilities, and equipment from severe or extreme meteorological conditions; are capable of responding to onsite accidents involving hazardous materials; and are skilled at preparing environmental, safety, health, and/or consequence assessments.
4. Equipped with adequately housed facilities including: communications systems, computer systems, and scientific instruments that maximizes output and effectiveness.
5. Provided with proper, dedicated equipment and instrumentation necessary to resolve the relevant meteorological parameters defining atmospheric transport and dispersion processes; and to identify meteorological conditions that could produce a threat or challenge to the safety or health of personnel, damage or destroy property or equipment, or lead to accidents resulting in injury or loss of life.

Besides considering the five programmatic attributes, the meteorological program reviewer may use the following six questions when conducting an assessment:

1. What is the quality of the meteorological data generated and/or provided to meteorological program customers? Is adequate data available to meet all customer needs?
2. Who are the current and future meteorological customers, and are their needs being served appropriately?
3. Are there adequate human resources available to meet present and future customer needs? Are those human resources being leveraged to the appropriate extent?
4. Are existing instrumentation, facilities, and systems adequate to meet the present and future customer needs?
5. Can the operation and management of site meteorological services be conducted in a more efficient and cost-effective manner?
6. Are meteorological data used to ensure the safety and health of personnel working at the site?

Qualified meteorologists should conduct the assessment as they are knowledgeable about meteorological monitoring programs. These qualified individuals should have a thorough understanding of processes and applicable procedures for carrying out assigned tasks.

The assessment tool is designed to cover an effective and accurate assessment of a meteorological site program and includes instructions for preparing, conducting, and following up with self-assessment activities. The components of the assessment tool include:

- Assessment instructions, plus an assessment process checklist
- Assessment tool package, with the following sub-categories:
  - Sample Plan of Action
  - Sample Schedule
  - Site Organization Notification
  - Lines of Inquiry (LOIs)
  - Samples Noteworthy Practices
  - Sample of Observations and Recommendations
  - Compliance Summary Table
  - Assessment Report Summary
  - Abbreviations and Acronyms

2. Self-Assessment Instructions

2.1 Preparing for the Self-Assessment

Conducting a self-assessment requires *advance planning* to ensure:

- Effective and efficient assessment periods are planned. This varies depending on the scope and depth of the assessment.
- Self-assessments may be completed in a couple of days or may require extended time.
- Self-assessments are structured to ensure a complete review of the program with minimum interruption to the program.

Self-assessments can be conducted by one reviewer or several reviewers. The team creates a *self-assessment plan* including:

- Activities conducted before, during, and after the self-assessment. This assists in keeping the assessment on track and ensures it is a manageable activity.
- A Self-Assessment Process Checklist. This is provided as part of the instruction section of this self-assessment tool.

Self-assessment tools are provided to assist in developing the scope of the activities (i.e., Plan of Action), developing a schedule of activities for conducting the assist visit (i.e., Schedule), as well as informing all site organizations of the upcoming review (i.e., Site Organization Notification), to ensure the organization concurs with the dates of the planned AV.

2.2 Conducting the Self-Assessment

Meteorological monitoring program performance criteria are organized into specific program areas based on the following applicable guidance documents:

- ANSI/ANS-3.11 (2011)–*American National Standard* for *Determining Meteorological Information at Nuclear Facilities*
- DOE/EH-0173T Chapter 4–*Meteorological Monitoring*
- DOE O 458.1–*Radiation Protection of the Public and the Environment*
- DOE O 414.1D–*Quality Assurance*

The specific program areas are:

- Meteorological Monitoring System
- Meteorological Observation Instruments
- Data Acquisition
- Data Management
- System Performance

LOIs are provided for each performance criterion to enable the reviewer(s) to ask appropriate initial and follow-up questions for maximizing the amount of information obtained from the site program managers.

These LOIs are designed to uncover programmatic weaknesses with a minimum number of questions. Writing space is provided for the reviewer to take sufficient notes on each inquiry to assist in the information gathering process.

Self-assessment LOIs are provided for the interviews with meteorological monitoring program custodians. These include, but are not limited to, individuals who:

- Perform surveillances
- Calibrate instrumentation
- Evaluate instrument siting adequacy
- Maintain all aspects of management of the meteorological data
- Perform quality assurance functions

Self-assessment LOIs are also provided for the interviews with the meteorological monitoring program customers. These include, but are not limited to the following line organizations:

- Compliance with the National Environmental Policy Act (NEPA)
- Environmental compliance
- Environmental Safety & Health
- Emergency preparedness
- Emergency response
- Integrated Safety Management
- Licensing
- Program maintenance
- Program operations
- Public outreach and external affairs

2.3 Post-Assessment Activities

The information gathered during the LOI process is summarized according to the following areas:

- Noteworthy practices
- Observations and recommendations
- Compliance with ANSI/ANS-3.11 (2010) performance criteria
- Summary of interviews with the meteorological program custodians and customers (i.e., Self-Assessment Report Summary)

Samples of noteworthy practices, observations and recommendations are provided.

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3. Self-Assessment Process Checklist

Phase	Checklist
Pre-assessment Planning	❒ Determine time frames for self-assessment activities ❒ Identify person(s) to conduct the self-assessment ❒ Meet with team members (if applicable) to ensure complete understanding of self-assessment tools and reporting protocols ❒ Gather and review applicable documentation ● ANSI/ANS-3.11 (2010) ● DOE/EH-0173T Chapter 4 ● DOE O 458.1 ● Applicable DOE Orders and Guides ● Applicable Federal, State, and local regulations ● Applicable site-level policies, manuals and procedures ❒ Arrange for personal interviews ❒ Develop a time schedule ❒ Confirm time schedule for the self-assessment
Conducting the Self-Assessment	❒ Interview meteorological program custodians using self-assessment LOI ❒ Interview meteorological program customers using self-assessment LOI ❒ Conduct meteorological monitoring equipment inspection and facility walkthrough, as appropriate ❒ Highlight areas that: ● Exemplify a noteworthy practice ● Are a strength of the program ● Need additional information ● Need improvement

Phase (Continued)	Activities (Continued)
Documenting the Results	❒ Use Samples of Noteworthy Practices and Observations/Recommendations to assist in documenting the results of the areas listed below: ● Noteworthy practice ● Strengths of the program ● Need for additional information ● Need for improvement ❒ Identify action items for improvement ❒ Prepare draft self-assessment report ❒ Ensure assessment team members review and provide feedback on the draft self-assessment report ❒ Review feedback and finalize draft self-assessment report ❒ Reconfirm factual review dates ❒ Submit draft self-assessment report to designated personnel for factual accuracy, review, and comments
Follow-Up Activities	❒ Review factual accuracy feedback ❒ As appropriate, update and finalize the draft self-assessment report ❒ Submit final self-assessment report to appropriate management and personnel ❒ Record and file supporting documentation

4. Self-Assessment Tools

4.1 Sample Plan of Action

- Conduct Entrance Meeting with Stakeholders
  - State purpose of self-assessment
  - Review process and worksheet
  - Discuss program mission, operational authorities, and customer products
  - Identify key points of contact for interviews, systems and facilities for surveillances
  - Discuss present programs and future missions
- Gather Information from Meteorological Custodians
  - Interview meteorological monitoring system custodians, and operations & maintenance (e.g., calibrations) personnel
  - Conduct surveillance of systems and facilities (e.g., instrument siting and exposure, condition of equipment)
- Gather Information from Meteorological Customers
  - Visit Emergency Operations Center (EOC) and other facilities that utilize meteorological products
  - Evaluate adequacy of meteorological data input to consequence assessment modeling and other analyses that use meteorological data
  - Interview EOC and other facility personnel on the adequacy of meteorological data input to emergency response, hazards assessment, and operations needs
- Collate and Consolidate Information
- Develop Preliminary Observations and Recommendations
- Conduct Exit Meeting
  - Discuss noteworthy practices and observations and recommendations
  - Outline final report elements and establish schedule

4.2 Sample Schedule

Day 1

- Conduct Entrance Meeting with Stakeholders **0800–1000**
  - State purpose of self-assessment, review previous assessments Evaluator
  - Review process/worksheets Evaluator
  - Discuss program mission, operational authorities customer products Facility
  - Identify key Points of Contact for surveillance of interviews, systems and facilities Facility
  - Discuss present and future programs Facility
- Information Gathering I: Meteorological Custodians **1000–1130**
- Lunch **1130–1230**
- Information Gathering II: Meteorological Customers **1230–1700**
  - Visit EOC and other facilities that use meteorological data products
  - Evaluate adequacy of meteorological input to consequence assessment modeling capability
  - Interview EOC personnel on adequacy of meteorological input emergency response, hazards assessment and operations
  - Perform surveillance of systems and facilities (e.g., instrument siting and exposure; condition of equipment)
  - Interview monitoring System caretakers and operations and maintenance personnel (e.g., calibrations)
- Adjournment Day 1 **1700**

Day 2

- Information Gathering II: Meteorological Customers (continued) **0800–1130**
  - State environmental oversight organization
  - Integrated safety management
  - Environmental compliance
  - Environmental safety & health
  - DOE/NNSA oversight
- Lunch **1130–1230**
- Collate and Consolidate Information **1230–1400**
- Develop Preliminary Observations and Recommendations **1400–1600**
- Conduct Exit Meeting **1600–1700**
  - Discuss observations and recommendations
  - Outline final report elements and establish schedule
- Adjournment Day 2 **1700**

4.3 Site Organization Notification

Notify all meteorological program custodians and customers by letter or e-mail of the plan to conduct a meteorological program assessment at least one month before the anticipated review. Request dates on which they will be available to ensure that as many custodians and customers as possible will be available to be interviewed. If scheduling issues occur, conduct the self-assessment in stages to accommodate schedule constraints.

Select the best schedule for the self-assessment to maximize custodian and customer involvement and inform all parties by letter or e-mail of the selected dates.

Personnel from the following departments, at a minimum, should be notified:

- Integrated Safety Management (ISM)
- Emergency Management & Response (EM&R)
- Environmental Compliance (EC)
- Environmental Safety & Health (ES&H)
- Licensing
- DOE/NNSA Oversight

4.4 Lines of Inquiry

LOIs are provided for each performance criterion in Section 2. This enables reviewer(s) to ask appropriate initial and follow-up questions. These LOIs are designed to uncover programmatic weaknesses with the minimum number of questions. Space is provided for the reviewer to take sufficient notes on each inquiry and assist in the final information review process.

The LOIs are provided in templates for easier interviewing with the meteorological monitoring program **custodians**. This includes, but is not limited to individuals who perform surveillances, calibrate instruments, evaluate instrument siting adequacy, maintain all aspects of management of meteorological data, and perform quality assurance activities.

Templates are also provided for the interviews with the meteorological monitoring program **customers**. These include, but are not limited to:

- Integrated Safety Management (ISM)
- Emergency Management and Response (EM&R)
- Environmental Compliance (EC)
- Environmental Safety and Health (ES&H)
- Licensing
- DOE/NNSA Oversight

Guidance is provided for the roll-up of the final information that is gathered into succinct observations and recommendations.

Program Area: **Meteorological Monitoring System**
Performance Criterion: **# 1-1**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 3.0

The Meteorological Monitoring System design is based on the needs and objectives of the facility and the guiding principles for making accurate and valid meteorological measurements.

A basic meteorological monitoring program consists of measurements of wind speed, wind direction, air temperature (i.e., ambient and the difference between two vertical levels on a tower), precipitation, and any combination of additional measurements necessary to determine stability class.

Lines of Inquiry

Question 1:
Describe the Meteorological Monitoring System in terms of the number of towers, locations, and instrumentation on each tower. State the monitoring levels that provide wind speed, wind direction, air temperature, temperature difference between two vertical levels on a tower, precipitation, and any combination of additional measurements necessary to determine stability class.

Response:

Question 2:
What measurements and typing technique are used to determine stability class?

Response:

Question 3:
When were the towers and instrumentation installed and what manufacturer and models of instrumentation are used?

Response:

Question 4:
Is a specification for the system available so that it can be determined that the design ensures that accurate and valid measurements are obtained?

Response:

Question 5:
Does the meteorological data from the system provide sufficient information for all of the meteorological information needs of the facility's organizational elements (e.g., emergency preparedness & response, documented safety analysis, environmental compliance, operations, licensing) that rely on the data?

Response:

Question 6:
Will the existing monitoring program be capable of supplying appropriate meteorological information for anticipated new missions?

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program Area: **Meteorological Monitoring System**
Performance Criterion: **# 1-2**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 3.1

The monitoring capability should be equipped with basic meteorological measurement sensors (i.e., wind speed, wind direction, temperature, atmospheric moisture, solar radiation, barometric pressure, and precipitation) suitable for continuous accurate operation, and meeting accuracy and resolution values identified in Table 1 of ANSI/ANS-3.11 (2010).

Lines of Inquiry

Question 1:
Has the instrumentation accuracy and resolution been compared to the requirements of Table 1, ANSI/ANS-3.11 (2010)? If so, does the instrumentation meet the requirements?

Response:

Question 2:
What is the power source for the instrumentation? Is there a backup source of power (e.g., solar panel, battery)?

Response:

Question 3:
Describe the nature of the shelter housing the data recording equipment. Is there a backup power source for the shelter air conditioning if the primary source is interrupted?

Response:

Question 4:
Are any meteorological parameters being monitored that do not support the fundamental meteorological needs of the site (e.g., atmospheric pressure, absolute humidity, soil moisture)?

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Meteorological Monitoring System**
Performance Criterion: **# 1-3**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 3.3.2

A permanent, dedicated meteorological monitoring capability is appropriately installed with lightning protection to minimize data losses. A back-up meteorological capability is available to avoid extended data losses.

Lines of Inquiry

Question 1:
Is the Meteorological Monitoring System equipped with lightning protection to minimize data losses? Describe the nature of the lightning protection system.

Response:

Question 2:
Does the Meteorological Monitoring System include more than one tower or a back-up tower in case of data loss?

Response:

Question 3:
Have percentage data recoveries been determined? Are they greater than 90%?

Response:

Question 4:
What is the typical repair or replacement time for faulty sensors?

Response:

Question 5:
Historically, how often do tower outages occur? What are the typical causes if they do occur?

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Meteorological Monitoring System**
Performance Criterion: **# 1-4**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 3.4

Parameters are monitored to enable stability class to be determined from meteorological monitoring capability measurements.

Lines of Inquiry

Question 1:

What meteorological parameters are monitored to determine atmospheric stability?

Response:

Question 2:
If vertical temperature difference is monitored, what are the monitoring heights? Are the temperature sensors paired (i.e., identical sensors)?

Response:

Question 3:
If sigma-theta (the second moment of the horizontal wind direction) is monitored, what are the sampling and averaging times? Do they meet the ANSI/ANS-3.11 (2010) standard of 180 samples per 15-minute averaging period?

Response:

Question 4:
If sigma-phi (the second moment of the vertical wind direction) is monitored, what are the sampling and averaging times? Do they meet the ANSI/ANS-3.11 (2010) standard of 180 samples per 15-minute averaging period?

Response:

Question 5:
If solar radiation is monitored, is the solar radiation-delta temperature (SRDT) scheme for stability classification considered as a back-up methodology?

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Siting of Meteorological Observation Instrument**
Performance Criterion: **# 2-1**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 4.5.3

The meteorological monitoring capability is appropriately sited and its instruments meet exposure criteria. The monitoring capability is sufficiently distant from plant and topographic obstacles. Instruments are appropriately aligned and sufficiently distant from anthropogenic heat sources.

Lines of Inquiry

Question 1:
Based on observation, is the tower(s) situated sufficiently away from facility structures to avoid being affected by aerodynamic motions generated by buildings?

Response:

Question 2:
Based on observation, is the tower(s) situated sufficiently away from trees and topographic obstructions so as to avoid interference?

Response:

Question 3:
Are the instruments located on the tower so as to meet ANSI/ANS-3.11 (2010) siting criteria?

Response:

Question 4:
Are there any nearby water bodies that could influence the tower measurements?

Response:

Question 5:
Based on observation, is the tower(s) situated sufficiently away from anthropogenic heat sources so as not to affect the measurements?

Response:

Question 6:
Based on observation, is the tower(s) situated sufficiently away from paved surfaces so as not to influence the measurements?

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Siting of Meteorological Observation Instrument**
Performance Criterion: **# 2-2**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 4.1

Existing monitoring programs should be reviewed periodically for conformance to siting guidance considering evolving program objectives, regulatory requirements, facility operating status and equipment capabilities.

Lines of Inquiry

Question 1:
Does the site periodically review its meteorological monitoring program for compliance with siting guidance (e.g., vegetative growth near the tower(s))?

Response:

Question 2:
Does the site periodically review its meteorological monitoring program relative to evolving objectives, regulatory requirements, and facility operating status?

Response:

Question 3:
When new construction or facility modifications are announced, does the site consider the potential impacts on the meteorological monitoring program?

Response:

Question 4:
Are there adequate human resources to conduct periodic reviews of the monitoring program?

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Siting of Meteorological Observation Instrument**
Performance Criterion: **# 2-3**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 4.2

Local topographical characteristics and its effects on meteorological flows are appropriately considered.

Lines of Inquiry

Question 1:
Was local terrain a consideration in the siting of the meteorological tower(s), so that measurements are representative of the local flow regime?

Response:

Question 2:
Are meteorological measurements representative of conditions at possible release locations on the site?

Response:

Question 3:
If applicable, are water bodies considered for their influence on the meteorological measurements (e.g., local circulations, temperature influences)?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Acquisition**
Performance Criterion: **# 3-1**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 5.1

The primary data recording system is electronic, while the back-up data recording system is analog or electronic.

Lines of Inquiry

Question 1:
Describe the primary data recording system. Is it an electronic system (e.g., Campbell Scientific data logger)?

Response:

Question 2:
How is the data transmitted for retrieval and archiving (e.g., telephone modem, microwave)?

Response:

Question 3:
Describe the method of backing-up the primary data recording system (e.g., CSI data logger, analog strip charts)?

Response:

Question 4:
If analog strip charts are used as a back-up recording device, how often are they inspected for possible replacement?

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Acquisition**
Performance Criterion: **# 3-2**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 5.2

Sampling frequencies for meteorological parameters (especially sigma theta) should be sufficient to ensure that the temporal data is representative.

Lines of Inquiry

Question 1:
What are the sampling frequencies for the meteorological parameters?

Response:

Question 2:
If sigma theta is calculated, is the sampling frequency at least 180 samples per 15-minute period?

Response:

Question 3:
What is the reporting frequency for the meteorological parameters, including precipitation (e.g., every 5 minutes)?

Response:

Question 4:
Is the tipping bucket rain gauge for precipitation scanned continuously for tips?

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Acquisition**
Performance Criterion: **# 3-3**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 5.3

Hourly-averaged meteorological parameters should contain a sufficient period of data.

Lines of Inquiry

Question 1:
What is the minimum averaging time for the recording of the meteorological data?

Response:

Question 2:
How are hourly averages of meteorological data determined? For example, how do you develop 15-minute averages?

Response:

Question 3:
Are the rain gauge total tips reported every 15 minutes along with all of the other meteorological data?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Acquisition**
Performance Criterion: **# 3-4**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 5.3.1

Appropriate algorithms should be employed to calculate the scalar (speed) and vector direction (components of wind velocity).

Lines of Inquiry

Question 1:
How is average scalar wind speed and vector direction calculated?

Response:

Question 2:
Do the average wind calculations conform to the standards of ANSI/ANS-3.11 (2010)?

Response:

Question 3:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Acquisition**
Performance Criterion: **# 3-5**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 5.3.2

For other primary variables such as air temperature, vertical temperature gradient, dew point temperature, barometric pressure and solar radiation, hourly averaged values may be determined by averaging samples over an entire hour or by averaging a group of shorter period averages. For precipitation, the hourly value should represent the total amount of precipitation measured in the hour.

Lines of Inquiry

Question 1:
How are averages of parameters such as air temperature, vertical temperature gradient, dew point temperature, barometric pressure and solar radiation determined?

Response:

Question 2:
How is precipitation totaled?

Response:

Question 3:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-1**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.1

Meteorological data bases should be temporally representative of the application to which it is applied.

Lines of Inquiry

Question 1:
How long has meteorological data been collected at the site?

Response:

Question 2:
Has the Meteorological Monitoring System been modified since its original installation? Have any instruments or towers been added?

Response:

Question 3:
How long has the present Meteorological Monitoring System been in operation?

Response:

Question 4:
What is the period of record for the archived meteorological data?

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-2**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.2

Data validation should include periodic review by qualified personnel. The review should include comparison with expected ranges of each parameter and inter-parameter checks.

Lines of Inquiry

Question 1:
Is the meteorological data validated by reviewing for possible erroneous values by qualified personnel? How often is the data reviewed?

Response:

Question 2:
Is any software used in the data validation process? If so, what functions does the software perform?

Response:

Question 3:
Do the data reviews include checks for values within expected ranges for the site? If so, how are the checks performed (e.g., software, spreadsheet, etc.)?

Response:

Question 4:
Are inter-parameter checks of the data performed, such as comparing different temperature values from different tower levels?

Response:

Question 5:
Are adequate human resources available to conduct the validation on a routine basis?

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-3**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.2

Flagged data should be further evaluated by qualified personnel to determine if it is truly erroneous or representative of an unusual weather condition.

Lines of Inquiry

Question 1:
If the data validation checks result in any suspicious values (i.e., flagged data), are they evaluated by qualified personnel to determine if they are actually erroneous or are just unusual values consistent with local climatology?

Response:

Question 2:
Are flagged data ever checked against weather maps for consistency with the weather pattern?

Response:

Question 3:
Is there a data validation procedure in place? Is the validation process documented and checked?

Response :

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.)

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-4**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.3

Data substitution techniques should include the use of a spatially representative data source(s) and a replacement methodology including redundant sensors and nearby sources.

Lines of Inquiry

Question 1:
Is data substitution used to fill in missing data due to the determination of erroneous values?

Response:

Question 2:
If data substitution is used, describe the methodology used (e.g., values from redundant sensors or from another tower level)? Is there a procedure in place?

Response:

Question 3:
If data substitution is used, are the substituted values noted in the database?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-5**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.4

Data recovery rates should be at least 90% for all parameters and 90% for parameters in joint frequency distributions.

Lines of Inquiry

Question 1:
Are meteorological data recovery rates determined on a regular basis? How often are they determined?

Response:

Question 2:
Are meteorological data recovery rates at least 90% for all parameters and 90% for joint frequency distributions?

Response:

Question 3:
Are recovery rates 90% or greater for the combination of wind speed, wind direction, and stability class indicator, all required for joint frequency distribution input into atmospheric transport and dispersion models?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 4-6**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.5

Raw data should be archived and retained for 5 years, while validated data is retained for the lifetime of the facility.

Lines of Inquiry

Question 1:
Is there a process in place for archiving and maintaining meteorological data? Where is the data archived?

Response:

Question 2:
Does the archiving process call for retaining validated data for the lifetime of the facility and raw data for a period of 5 years?

Response:

Question 3:
Is the archival of meteorological data properly documented within a Records Management Program (RMP)?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **#4-7**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 6.6

Data reporting should be in joint frequency distributions or tailored to the specific customers needs.

Lines of Inquiry

Question 1:
Are the meteorological data processed into joint frequency distributions? Are any other formats used to summarize the data for specific customer needs (e.g., CAP88-PC format)?

Response:

Question 2:
Is software used to process the data into various summaries and formats properly documented?

Response:

Question 3:
[Include additional questions as needed.]

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: System Performance
Performance Criterion: # 5-1
Interviewee: System Custodian

Compliance Basis: ANSI/ANS-3.11 (2010), Section 7.1

Total system accuracy should be calculated using the root-mean-square methodology and should meet the requirements of Exhibit-1 of ANSI/ANS-3.11 (2010).

Lines of Inquiry

Question 1:
Is the total meteorological system accuracy calculated using the Root Sum of Squares (RSS) methodology?

Response:

Question 2:
Does the total meteorological systems accuracy meet the requirements of Exhibit-1 of ANSI/ANS-3.11 (2010)?

Response:

Question 3:
[Include additional questions as needed.]

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 5-2**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 7.2

A system calibration program should be established and instruments calibrated at least every six months.

Lines of Inquiry

Question 1:
Is a meteorological system calibration program in place?

Response:

Question 2:
Are meteorological sensors calibrated every 6 months? If not, how often are they calibrated?

Response:

Question 3: How are the calibrations documented and archived?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Question 6:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 5-3**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 7.3

The meteorological system should be protected from lightning and severe environmental events, and maintained/inspected to ensure meeting data recovery objectives.

Lines of Inquiry

Question 1:
Is the meteorological system protected from lightning strikes using a lightning protection system?

Response:

Question 2:
Is there a backup power supply if the tower's normal power supply is interrupted (e.g., battery backup)?

Response:

Question 3:
How often are the tower(s) and sensors inspected to confirm proper operation?

Response:

Question 4:
Is a meteorological system inspection procedure in place?

Response:

Question 5:
How often is the area surrounding the tower(s) inspected for vegetative growth that may impact the measurements?

Response:

Question 6:
Is a meteorological system spare-parts-management procedure in place?

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

Program: **Data Management**
Performance Criterion: **# 5-4**
Interviewee: **System Custodian**

Compliance Basis: ANSI/ANS-3.11 (2010), Section 7.4

A quality assurance program should be in place that meets the criteria defined in ANSI/ANS-3.2.

Lines of Inquiry

Question 1:
Is a data quality assurance program in place that meets the criteria of ANSI/ANS-3.2?

Response:

Question 2:
Describe the nature of the data quality assurance program (e.g., methods/software used).

Response:

Question 3:
Does the data quality assurance program include information on project organization and responsibility, Data Quality Objectives (DQOs), sampling procedures, sample custody, calibrations, analytical procedures, data reduction, validation, reporting, internal quality control checks, performance and system audits, preventive maintenance, assessment of data precision, accuracy, and completeness, corrective actions, and Quality Assurance (QA) reports to management?

Response:

Question 4:
[Include additional questions as needed.]

Response:

Question 5:
[Include additional questions as needed.]

Response:

Summary:

The Performance Criterion:

Met ☐

Partially Met ☐

Not Met ☐

4.5 Sample Noteworthy Practices

Noteworthy practices that stand out as exceptional elements of the meteorological monitoring program should be highlighted. Examples are:

NOTEWORTHY PRACTICE # 1:
The meteorological program is mature and runs efficiently, providing quality-assured meteorological data from meteorological towers to a variety of site program elements, including those that protect the safety and health of workers and the public. All meteorological program customers, especially Emergency Management and Response (EM&R), indicated satisfaction with the meteorological products and services provided to them.

NOTEWORTHY PRACTICE # 2:
The meteorological program has an excellent web page that provides a variety of meteorological products to customers and workers. It has an excellent feature that permits the user to download the data in various formats compatible with a variety of atmospheric transport and dispersion models (i.e., CAP88, ISCST3, MACCS2).

4.6 Sample Observations and Recommendations

Important observations on any deficiencies in the meteorological monitoring program should be noted and recommendations to improve those areas should be summarized. Examples of such observations and recommendations are:

OBSERVATION # 1: The scope of the existing meteorological program cannot be effectively accomplished with the present manpower allocation. The Emergency Response Organization (ERO) meteorologist/consequence assessor, should be 3-deep, but is presently 1-deep. When this individual is ill or on vacation, there is no coverage. This is further exacerbated by the expected learning curve of two individuals who have recently joined the program, due to recent retirements.

RECOMMENDATION # 1: Perform a Job Task Analysis of the meteorological program and determine realistic manpower requirements, and account for program upgrades to meet all customer needs. Consider an increasing Full-Time-Equivalent count of meteorologists, instrumentation technicians, and software developers ready to meet any identified human resource requirement.

OBSERVATION # 2: The meteorological tower(s) may not be sufficient to develop an accurate three-dimensional wind field, which is necessary to drive the complex terrain transport and dispersion model, which is needed to make accurate protective actions for workers and protective action recommendations for the public. Additional strategically-placed meteorological towers and/or SODAR may need to be deployed to effectively characterize the three-dimensional flow field.

RECOMMENDATION # 2: Perform a wind field study of the site area to determine the locations of additional 10-meter meteorological towers and a Sonic Doppler Acoustic Radar that will supplement the wind field and enhance three-dimensional transport and dispersion model results. In addition, evaluate whether an existing meteorological tower is located within 2 kilometers of all potential release points, as indicated in DOE Guide 151.1-1.

OBSERVATION # 3: It was noted at a visit to the meteorological tower(s) that each was appropriately sited to avoid wind and temperature field interference from nearby obstacles (i.e., buildings, trees). However, recent tree growth may be affecting the measurements. In addition, brush growth around the tower and instruments is somewhat excessive.

RECOMMENDATION # 3: During the next surveillance, determine whether the trees in a full 360-degree azimuth of the towers exceed the ANSI/ANS-3.11 (2010) recommended 10:1 ratio. If it is determined that some of these trees may be too tall, consider cutting the uppermost branches. In addition, periodically cut brush growth before it affects the measurements.

OBSERVATION # 4: It is difficult to identify some of the customers of the meteorological program since many customers access the data from the internet page. Without knowing the customers, it is impossible to periodically meet with them to ensure that their data needs are being met and that their additional data requirements are being identified.

RECOMMENDATION # 4: Through internet protocol addresses (e.g., user provides e-mail address to obtain information), determine the statistics of data users (e.g., number of data requests per Division). Consider meeting with divisions that are heavier users to (1) ensure that their data needs are being met; and, (2) consider requesting recharge.

OBSERVATION # 5: At all of the meteorological monitoring stations, the environmentally-controlled shed which houses the data logging equipment is cooled by an air conditioner. If the air conditioner fails due to mechanical problems or a loss of power to the shed, there may be equipment failure and data loss until the next surveillance is conducted and the failure is noticed.

RECOMMENDATION # 5: Develop an electronic signal to remotely indicate to the instrument technician's office the air temperature of the shed which can establish whether the air conditioner is operating so that its failure can be detected in a timely manner.

OBSERVATION # 6: ANSI/ANS-3.11 (2010) states that existing meteorological monitoring programs should be reviewed periodically for conformance to siting guidance, considering evolving program objectives, regulatory requirements, facility operating status, and equipment capabilities. The meteorological program has not had an assessment or self-assessment for many years.

RECOMMENDATION # 6: The meteorological program should undergo a self-assessment on an annual basis to ensure that evolving program objectives, regulatory requirements, facility operating status, and equipment capabilities are being effectively addressed. If deficiencies are noted, program improvements should be undertaken. Third-party assessments should be considered every three years.

OBSERVATION # 7: The Quality Project Plan (QPP) for the meteorological monitoring program does not adequately describe the program's quality assurance principles. A revision should be completed in a timely manner and compared to ANSI/ANS-3.2, which is recommended in ANSI/ANS-3.11 (2010).

RECOMMENDATION # 7: Review ANSI/ANS-3.2 for applicability to the QPP. Complete and issue the QAPP and periodically ensure it is a current version.

OBSERVATION # 8: Field surveillances are infrequently conducted at meteorological tower(s). In addition, a surveillance procedure and checklist is not in place.

RECOMMENDATION # 8: Consider developing and implementing a meteorological tower field surveillance procedure and checklist.

OBSERVATION # 9: A RSS calculation of system accuracy for each meteorological parameter has not been developed and compared to accuracy standards, as recommended in ANSI/ANS-3.11.

RECOMMENDATION # 9: Although the calibration procedure comparison of existing instrumentation to National Institute for Standards and Traceability instrumentation provides reasonable assurance of system accuracy, the RSS calculations will remove any doubt the meteorological measurements are within the accuracy limitations of ANSI/ANS-3.11 (2010), Table 1.

OBSERVATION # 10: ANSI/ANS-3.11 (2010) recommends that field calibrations of meteorological instrumentation be performed on a semiannual basis. Recently, the meteorological calibration cycle is every two years, which is not frequent enough!

RECOMMENDATION # 10: Implement a field calibration six-month cycle for the meteorological tower(s).

OBSERVATION # 11: There is no formal procedure that enables the management of meteorological system spare parts. With only an informal accounting of the spare parts, the risk of running low on vital parts is increased. This can lead to undesirable instrument outages if replacement parts are unavailable. Overall system redundancy should be addressed.

RECOMMENDATION # 11: Consider developing and implementing a meteorological system spare parts management procedure. Develop an analysis of meteorological system components to determine areas where there are single points of failure and redundancy is lacking.

OBSERVATION # 12: A procedure and training program to assist the site-wide user community in the usage of meteorological data and products has not been developed. This procedure and training program will ensure that all site data users access and apply meteorological data effectively.

RECOMMENDATION # 12: Consider developing and implementing a procedure and training program on the accessing and application of meteorological data and products.

4.7 Compliance Summary Table

The following table summarizes the meteorological program compliance posture with respect to the performance objectives identified in ANSI/ANS-3.11 (2010).

Use the information from the LOIs to develop this table. In addition, ensure that each ANSI/ANS-3.11 (2010) Performance Criterion that either partially meets its objective or does not meet its objective is correlated with the applicable observation(s).

ANS-3.11 (2010) Performance Criterion	Meets Objective	Partially Meets Objective	Does Not Meet Objective	Related Observation(s)
1-1				
1-2				
1-3				
1-4				
2-1				
2-2				
2-3				
3-1				
3-2				
3-3				
3-4				
3-5				
4-1				
4-2				
4-3				
4-4				
4-5				
4-6				
4-7				
5-1				
5-2				
5-3				
5-4				
TOTAL				

5. Self-Assessment Report Summary

Improvement Item(s):	Action Item(s):

6. Abbreviations and Acronyms

A

ANS	American Nuclear Society
ANSI	American National Standards Institute

B

C

CAP88-PC	Clean Air Package 1988 (EPA Software program for estimating doses
CSI	Campbell Scientific data logger

D

DMCC	DOE Meteorological Coordinating Council
DOE	Department of Energy
DQO	Data Quality Objective

E

EC	Environmental Compliance
e-mail	electronic mail
EH	Environmental Health
EMI SIG	Emergency Management Issues Special Interest Group
EM&R	Emergency Management and Response
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERO	Emergency Response Organization
ES&H	Environmental Safety & Health

F

G

G	Guide

H

I

i.e.	that is
ISCST3	Industrial Source Complex Short-Term
ISM	Integrated Safety Management

J

JFD	Joint Frequency Distribution

K

L

LOI	Lines of Inquiry

M

MACCS2	MELCOR Accident Consequence Code System

N

NEPA	National Environmental Policy Act
NIST	National Institute for Standards and Traceability
NNSA	National Nuclear Security Administration

O

O	Order

P

Q

QA	Quality Assurance
QPP	Quality Project Plan

R

RMP	Records Management Program
RSS	Root Sum of Squares

S

SODAR	Sonic Doppler Acoustic Radar
SRDT	Solar Radiation Delta Temperature

T

U

UPS	Uninterruptible Power Supply
U.S.	United States

V

W

X

Y

Z